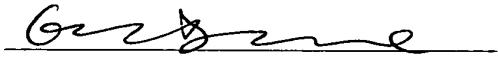


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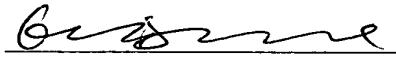
PATENT APPLICATION OF

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FOR

THERMAL PRINTER ASSEMBLY

Respectfully submitted,



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THERMAL PRINTER ASSEMBLY

Reference to Related Application

[001] This application claims the benefit of provisional application serial no. 60/436,208, filed December 23, 2002.

Technical Field

[002] The present invention relates to thermal printer assemblies and particularly to such assemblies in which a plurality of print heads are used to span a larger print media widths.

Background

[003] Modern thermal print heads have achieved levels of resolution based upon integrated circuit construction techniques which can locate a great number of individual heating elements in close proximity to each other. This advantage of resolution creates a limitation on the total span of the print head due to the possibility of faults occurring in the semiconductor, both in the manufacturing process and later in the printing application. Larger print spans have been achieved by aligning two or more smaller print heads to achieve the wider span. Also, due to the resolution achieved, relatively small misalignment between such multiple print heads are easily noticed in the resulting printed product. Even misalignments of as little as one pixel can be visually determined.

[004] The construction and accuracy of multiple thermal print head alignment is further challenged by

the need to substantially squeeze the print media against the thermal print head to provide good thermal conductivity.

Summary of the Invention

[005] The present invention relates to a thermal printer assembly including a plurality of elongated thermal print heads and a frame adapted to fixedly mount and align the plurality of print heads in parallel to print across a single print media path. The frame may be adapted to align the print heads to print across substantially different lateral portions of the print media path. Each of the elongated print heads has a printing length, and the frame may be adapted to align the print heads to print across a print media width, which is substantially equal to a total of the printing lengths of the plurality of print heads. Each of the print heads may be positioned to print at a different sequential location along the print media path.

[006] The assembly may include a separate platen roller adapted for pressuring print media against each of the print heads. Each platen roller may be approximately as long as its respective print head. Each platen roller determines a curvature in the print media path, and the assembly may include a member having a low friction surface adapted to mimic that curvature in alignment with a platen roller across a lateral portion of the print media path not spanned by such platen roller. The platen roller and the low friction surface may be aligned across the print media path at a single sequential position along the print media path.

[007] The frame may be adapted to position the plurality of thermal print heads to print from a first side of the print media path, and the assembly may further include a second plurality of elongated thermal print heads fixedly mounted to the frame for printing from a second opposing side of the print media path.

[008] The variations described above provide improved print head alignment and heat dissipation for greater reliability. Double sided printing can be efficiently accomplished at no expense to the recited benefits.

Brief Description of the Drawings

[009] For a better understanding of the invention as well as other objects and further features thereof, reference is made to the following detailed description of various preferred embodiments thereof taken in conjunction with the accompanying drawings wherein:

[010] Fig. 1 is a perspective view of one side of an embodiment of a thermal print head assembly according to the invention;

[011] Fig. 2 is a perspective view of the other side of the assembly of Fig. 1;

[012] Fig. 3 is a perspective view of a portion of the assembly of Figs. 1 and 2 in combination with an additional printer component;

[013] Fig. 4 is a perspective diagram of a print media path through the assembly of Figs. 1 and 2; and

[014] Fig. 5 is a perspective view of the content of Fig. 3 in combination with yet another component.

Description of the Preferred Embodiments

[015] Fig. 1 shows a thermal print head assembly 10 generally including a plurality of elongated thermal print heads 12 and 14 and a frame 16. Frame 16 mounts print heads 12 and 14 to print across a print media path 18 with print heads 12 and 14 being oriented in parallel and orthogonally to the direction of print media movement indicated by arrows 20.

[016] Frame 16 is provided in two complementary sections 16a and 16b with section 16a mounting print heads 12 and 14 and section 16b mounting an additional plurality of print heads 22 and 24. For the purpose of this disclosure, print heads 12, 14, 22 and 24 necessarily include a semiconductor portion, 22a and 24a, shown for print heads 22 and 24 and a holder portion, 12b and 14b, shown for print heads 12 and 14. The semiconductor portions 22a and 24a are the printing side of the print heads and include hundreds of semiconductor heating elements formed per linear inch of the elongated semiconductor elements.

[017] By this arrangement of frame sections 16a and 16b, each mounting a plurality of print heads, 12 and 14 and 22 and 24, respectively, assembly 10 defines print media path 18 passing between frame sections 16a and 16b and through slot 26. Print heads 12, 22, 14 and 24 are thereby arranged to print sequentially, in that order, along print media located in print media path 18.

[018] Fig. 2 shows the opposite side of assembly 10 and the respective opposite sides of print heads 12, 22, 14 and 24. The fixed mounting of these thermal print heads provides excellent heat dissipation for the

heating elements in the semiconductor portions and also eliminates the wear and tear of movement on wires used for driving those heating elements.

[019] By this arrangement frame 16a positions print heads 12 and 14 to print across substantially different lateral portions of print media path 18. Print heads 12 and 14 and 22 and 24 are shown to be elongated with an identifiable print length and frame 16 positions print heads 12, 14, 22 and 24 across the width of print media path 18, which width is substantially equal to the total of the printing lengths of either plurality of print heads 12 and 14 or 22 and 24. Each of the thermal print heads is positioned to print at a different sequential location along print media path 18 in the direction of print media travel 20.

[020] Fig. 3 shows frame section 16b of assembly 10 (Fig. 1) in combination with a pair of platen roller assemblies 32 and 34 being mounted on a support member 36. Each platen roller assembly includes a platen roller 32a and 34a, respectively, and a mounting frame 32b and 34b, respectively. Platen rollers 32a and 34a are aligned with the semiconductor surfaces 22a and 24a of respective print heads 22 and 24 (Figs. 1 and 2) in a position for biasing print media located therebetween against the respective print heads 22 and 24. Platen rollers 32a and 34a are approximately as long as, or only slightly longer than, the printing length of print heads 22 and 24, and platen rollers 32a and 34a are further each spring biased from their respective mounting frames 32b and 34b for allowing rollers 32a and 34a to conform as necessary to their respective print heads 22 and 24. Frame section 16a is not present in

Fig. 3 for purposes of clarity in showing the interaction between print heads 22 and 24 and platen roller assemblies 32 and 34.

[021] Whereas, existing thermal printers mount multiple print heads along a single platen roller, the present application of individual platen rollers to each separate print head provides a better interface function between the platen roller and print head to control thermal contact between print media and the print heads. The improved roller to print head contact of separate rollers thereby improves the performance of the present fixed print head arrangement. Better conformance between the print heads and their associated platen rollers is provided by the use of the shorter, and thereby stiffer, platen rollers.

[022] Fig. 4 shows the effective path for a piece of print media 40 as it passes sequentially across print head semiconductor portions 12a and 22a and 14a and 24a and is pressed there against by respective platen rollers 42a and 32a and 44a and 34a. Print media 40 is shown in Fig. 4 with a multiplicity of lines 48-51 extending there across. These lines 48-51 represent bends in the print media path which are determined by platen rollers 42a, 32a, 44a, 34a. Because thermal print head semiconductor portions 22a and 24a, for example, and their respective platen rollers 32a and 34a only extend partially across the width of the print media path 18, it is important for wrinkling prevention to support print media 40 in the areas of the bends or lines 48-51 to maintain the curvature of print media 40 across the lateral portions thereof not supported by the respective platen rollers.

[023] It will be noted that the print heads can overlap each other in the direction of print media travel, as illustrated in Fig. 4. By arranging the print heads to overlap "electronic stitching" of images can be carried out.

[024] For the purpose of enhancing wrinkle prevention, Fig. 5 shows the frame section 16b and support member 36 of Fig 3 in combination with platen roller assemblies 32 and 34, with the addition of media support members 52 and 54. Members 52 and 54 each includes a low friction surface 52a and 54a, respectively, adapted to mimic the curvature of their respective platen rollers 32a and 34a. For this purpose, media support members 52 and 54 are mounted in alignment with respective platen roller assemblies 32 and 34, respectively, in an orthogonal direction across the width of the print media path 18. In this manner, the areas of print media 40 (Fig. 4) located along lines 48-51 are properly supported through the indicated curvatures of print media 40 thereby preventing unwanted distortion and wrinkling of print media 40.

[025] It should be noted that although media support member 54 is shown as a separate member it can be integrated into the frame.

[026] By the arrangement described above, frame 16 positions the plurality of print heads 12 and 14 to print from a first side of the print media path 18 and further positions a second plurality of print heads 22 and 24 for printing from a second opposing side of the print media path 18.

[027] Although the invention has been described in detail with respect to various preferred embodiments thereof, it will be recognized by those skilled in the art that the invention is not limited thereto but rather that variations and modifications can be made therein which are within the spirit of the invention and the scope of the amended claims.